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ABSTRACT

This study investigated the predictive validity of the admission criteria for masters students in reading: undergraduate grade point average (GPA), Graduate Record Examination (GRE) scores, undergraduate college quality, and age. Data were gathered for 94 former masters students at Rutgers University, including 53 who had obtained the M.Ed. and 41 who had dropped out. The graduated and not-graduated groups differed significantly only on the GRE-Verbal. For the graduated group, GPA and age yielded significant correlations with the time-to-degree criterion. The results from this study were interpreted as being consistent with those of other predictive studies in education. (Author/AA)

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A VALIDITY STUDY OF ADMISSION CRITERIA FOR MASTERS STUDENTS IN A READING PROGRAM

AN ABSTRACT OF A THESIS

SUBMITTED TO THE FACULTY

OF THE GRADUATE SCHOOL OF EDUCATION

OF

RUTGERS

THE STATE UNIVERSITY OF NEW JERSEY

BY

JOHN O. HERITAGE

IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE

OF

MASTER OF EDUCATION

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

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NEW BRUNSWICK, NEW JERSEY JUNE, 1977

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ABSTRACT

The purpose of this study was to investigate the predictive validity of the admission criteria of undergraduate GPA, GRE scores, undergraduate college quality, and age. Attainment of the M.Ed. and time taken to attain the M.Ed. served as the success criteria.

Data for all predictors was gathered for 94 former master's students of the Rutgers University reading program. Of these students, 53 had obtained the M.Ed. and 41 had dropped out of the program. The groups were designated as "graduated" and "not-graduated," respectively. For the graduated group data was also gathered for the number of years taken to attain the M.Ed.

Comparisons for the admission criteria were made between the graduated and not-graduated group. Correlation coefficients were computed to determine if significant correlations existed between the predictors and the success criteria.

The graduated and not-graduated groups were found to be significantly different at the .05 level on the GRE-Verbal only. The GRE-Verbal yielded the

highest correlation with the success criterion of master's degree attainment. For the graduated group, GPA and age yielded significant correlations with the time to degree criterion.

The magnitude of the GRE-Verbal correlation found in this study is essentially consistent with those median validity correlations for Chemistry, English, and Psychology. In addition, the relatively high ranking of the GRE-Verbal correlation among the other predictors is similar to those found in other predictive studies in education.

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CHAPTER I

INTRODUCTION

The problem of deciding who shall be admitted to graduate and professional schools and what factors predict success has been of great concern to graduate schools for many years. Commonly such factors as undergraduate grade point average, test scores (e.g., GRE scores), and letters of recommendation have been considered by the majority of graduate schools (Lannholm, 1968b). Surprisingly, however, many graduate institutions report that few validity studies have been conducted to verify their admission criteria (Faia, 1969; Dremuk, Anderson, & Hein, 1970). Furthermore, while graduate schools report using a variety of criteria to predict success they often lack any standard method of assigning weights to these admission criteria (Lannholm, 1968b).

The studies which have been reported have used a variety of variables as predictors of success as well as a number of success criteria. Results have varied greatly. The most common success criterion used has been that of graduate school grade point average.

However, the high selectivity of students admitted for graduate study and the subsequent limited range of grade point average as well as the recent use of pass/fail grades makes the GPA criterion practically useless. Other criteria of success used have been: (1) faculty ratings, (2) scores on a comprehensive examination, (3) evaluation of research work, (4) attainment of the Ph.D., and (5) on the job performance. Some of the most recent work in the field has been concerned with specific critical incidents which lead to success in graduate school (Reilly, 1974).

One basic measure of success in graduate school would seem to be attainment of the desired degree. While this has been most widely used at the Ph.D. level (Creager, 1965; Williams, Harlow, & Grab, 1970), it has seldom been employed at the master's level. Indeed, its use at this level has been questioned (Willingham, 1973). Dremuk et al. (1972) suggest the possibility that motivation is the single, most important factor in determining graduate school success. However, motivation is not easily measured and is therefore impractical in studies which rely heavily on the GRE. Attainment of the desired degree and a measure of time taken to accomplish this goal could also represent at least an approximation of the student's motivation and hence success.

This study is an ad hoc investigation which focuses on selected measurable criteria used by the Rutgers Reading Program for admitting students to the master's program. Further, the study seeks to determine how these criteria apply to those who obtain the master's degree as compared to those who don't graduate. Validity coefficients will be computed in order to measure the degree of association between the various criteria as well as the consistency of the variables within the group that graduates.

Hypotheses

For convenience the study is organized into two main sections assessing the selected criteria for the graduated versus the not-graduated group and for the graduated group only.

Graduated vs. Not-Graduated Group

There will be no significant differences between the graduated and not-graduated groups in the following variables:

1. Undergraduate GPA;
2. Verbal scores on the Graduate Record Examination;
3. Quantitative scores on the Graduate Record Examination;

4. Quality of the undergraduate school attended; and
5. Age levels.

Graduated Group

For the graduated group there will be no significant correlation between the time taken to attain the M.Ed. and the following five variables:

1. Undergraduate GPA;
2. Verbal scores on the Graduate Record Examination;
3. Quantitative scores on the Graduate Record Examination;
4. Quality of the undergraduate school attended; and
5. Age levels.

Importance of the Study

This study fulfills a need to obtain the predictive validity of various admission criteria currently in use by the Rutgers Reading Program. If the admission criteria are not valid predictors of graduation, then some re-evaluation of present procedures may be warranted. In a time when money is tight and manpower low this investigation may help the efficiency of the reading program by enabling it to focus time and energy in appropriate areas.

Definition of Terms

Undergraduate GPA was defined as the grade point average for four years of college based on a high grade of 4.0 to a low grade of 1.0.

Verbal score on the Graduate Record Examination was defined as the standard score obtained on the verbal section of the GRE based on the norms for the years 1966-1974.

Quantitative score on the Graduate Record Examination was defined as the standard score obtained on the quantitative section of the GRE based on the norms for the years 1966-1974.

Quality of undergraduate school was defined as the selectivity index (ranging from a low of 1 to a high of 7) of the college found in Astin's Predicting Academic Performance in College, 1971. For the few schools which did not appear in this publication, Cass and Birnbaum's (1968) Comparison Guide to American Colleges was consulted, and an appropriate rating assigned.

Age was defined as the age of the student in years at the time of admission to the reading program.

Time to Degree - the number of years elapsed between initial enrollment and attainment of the M.Ed.

Limitations of the Study

Any study of this nature suffers from certain inherent limitations. Most obvious is the fact that the subjects have already been screened before being admitted to the reading program. This restricts the range and may cause validity coefficients to be small. Furthermore, the "not-graduated" group included all students who did not complete the program, regardless of their reasons. There is the possibility that students may leave the program to transfer and obtain a master's degree elsewhere. But numbers and limited information prevented conducting the study otherwise. Further, some of the people classified as "not-graduated" because of not being enrolled in the last year, might re-enroll and complete their degree in another program within Rutgers University.

CHAPTER II

REVIEW OF LITERATURE

This chapter will present many of the validity studies that have been reported to date. Emphasis has been placed on those studies most pertinent to the present investigation. Since many of the studies were unpublished and accessibility limited, much reliance has been placed on literature searches conducted by Lannholm (1968, 1972) and Willingham (1973) at Educational Testing Service in Princeton, New Jersey.

The studies will be reviewed in the following manner: (1) studies using institutional quality indices; (2) studies using graduation versus non-graduation as the success criterion; (3) studies using faculty ratings as the success criterion; (4) studies using comprehensive examination scores as the success criterion; and (5) other studies relevant to this investigation.

Studies Using Institutional Quality Indices

The majority of studies attempting to predict graduate school success have not employed any measure of undergraduate institutional quality. However, some

colleges do report that they do consider the quality of the undergraduate school when reviewing applicants (Lannholm, 1968b). Although this may be an informal weighting in most instances, nevertheless, it is a consideration (Lannholm, 1968b).

Early work in the field of institutional quality was conducted by Knapp and Greenbaum (1953) who analyzed a group of 7000 scholars from various parts of the country. These scholars were Ph.D. graduates from some 562 different colleges. The undergraduate colleges of these scholars were examined along four lines: (1) cost; (2) geographical location; (3) type of administrative control; and (4) size. The investigators had no published information on the intellectual ability of the student bodies and saw no way to evaluate the quality of faculty. They did indicate that the highest cost institutions produced the greatest quantity of scholars. Furthermore, there seemed to be an optimal size of graduating class for the most productive schools.

Astin (1968) examined some traditional indices of institutional quality using a sample of 669 students from a random stratified sample of 248 colleges and universities. Scores on the GRE and three Area Tests in social sciences, humanities, and natural sciences were used as student output measures. Student input measures used were 103 items on a questionnaire given

to incoming freshmen. Scores on the National Merit Scholarship Qualifying Test were included in this data. High school grades provides further input data.

The principal quality measures investigated by Astin (1968) were: (1) selectivity--an estimate of the average academic ability of the incoming students; (2) per student expenditures for educational and general purposes; (3) the number of books in the library; (4) number of books per student; (5) number of faculty with the Ph.D. degree; (6) faculty student ratios; (7) total affluence; and (8) academic competiveness. As a result of his investigation Astin (1968) stated that "differences in student achievement during the senior year were much more highly dependent upon variations in student characteristics that existed before entrance into college than upon the characteristics of the undergraduate college attended" (p. 667).

In a study for the National Opinion Research Center Spaeth (1966) sent out questionnaires to 41,000 graduates and received an 84% response. This study was aimed primarily at investigating the idea that science and engineering students from universities were more successful in graduate school than those from liberal arts colleges. Students from all academic areas were included in the study. Results did show that in the sciences the students from universities held a slight advantage over those from small colleges. In the

non-scientific fields college type was not a significant factor. Spaeth's conclusions seem in agreement with Astin (1968) in that he also found the intellectual caliber of the student body of the college to be the most important predictor of graduate school success for its students.

Lannholm's (1972) review included a study which was conducted on 1755 graduate students at Florida State University. This study used a selectivity index (unidentified in the report) as well as GRE scores and GPA for predictors of graduate school success. The undergraduate GPA for the first sixty hours of study and the GPA for the last sixty hours made up the other two predictors. The criterion of success was graduate school GPA. Results showed the need for analyzing departments separately since prediction patterns varied with the academic area. Further conclusions were that GRE scores should be considered separately and not in combination. The verbal scores of the GRE were more reliable predictors than the quantitative scores of the GRE. The selectivity index was found to be meaningfully related to the success criterion.

Another investigation making use of a rating of the undergraduate college was carried out by Hackman, Wiggins, and Bass (1970). For this study the subjects

were 42 doctoral students in psychology at the University of Illinois. A quality rating was assigned to each student's undergraduate psychology department. This was accomplished by having a University committee rate the undergraduate department as: (1) of dubious academic quality, (2) average, or (3) excellent. Other predictors employed were the GRE-quantitative, GRE-verbal, GRE-Advanced Psychology Test, foreign language abilities, undergraduate GPA, GPA in math, science, biology and social sciences. Success criteria used were both short term and long term. The short term criteria were GPA in major courses, first year faculty ratings, and first year student self-perceptions of progress. A faculty devised nine-point rating scale designed to measure student success after six years served as the long term success criterion.

Results showed consistently negative correlations between GPA and the long term criterion. While GRE-verbal and GRE-quantitative were positively related to most first year criteria, the GRE-quantitative was the only one of the two significantly related to the long term criterion. The quality of the undergraduate psychology department was found to have the highest correlation (.43) with the long term criterion. The GRE Advanced Psychology Test did not appear as a good success predictor.

Institutional quality indices were also considered in a study by Gertler and Meltzer (1970) who studied the publication output of Ph.D. graduates of Carnegie-Mellon University. A "quality adjusted index of professional output" which considered both amount and quality of publications was constructed. This publication index was correlated with the predictors of GRE scores or scores on the Admission Test for Graduate Study in Business (ATGSB) as well as GPA, age at entrance, previous graduate work, type of undergraduate degree, and three measures of undergraduate school quality. The two published indices used were those in Cass and Birnbaum (1968) and College Rater (1967). The third quality index was the mean ATGSB score for all students taking the test at the applicant's college for the years 1957-1962.

All three of the quality indices were found to be insignificantly related to Ph.D. output. The GRE and ATGSB scores also were not useful predictors. However, the undergraduate GPA was a valid predictor. The researchers concluded that undergraduate GPA provided an indication of motivation relevant to future success and that younger students are more likely to succeed than the older ones.

Dawes (1971) conducted a two part investigation in the graduate psychology department at the University of Oregon. Subjects for the first part of the study were 111 graduate students. Predictors used were GPA, total raw score on the GRE (verbal + quantitative), admission committee ratings, and a measure of quality of the undergraduate college. The quality index used was that of Cass and Birnbaum (1968). "The verbal categories of selectivity were given numerical values according to the following rule: most selective, 6; highly selective, 5; very selective (+), 4; very selective, 3; selective, 2; not mentioned, 1" (p. 184). The success criterion was a faculty rating scale. Ratings were collected for all students in the spring of 1969 who had been admitted between 1964 and 1967 and had not dropped out for non-academic reasons.

Results indicated that both the undergraduate GPA (.21) and the selectivity index (.25) were more highly correlated with the success criterion than were the admission committee ratings (.19) or the GRE (.11). A multiple regression analysis of the GRE, GPA, and the quality index yielded a multiple R of .40.

The second part of the study involved 384 applicants for the graduate school in the fall of 1969. The predictors, GRE-V+Q, GPA, and quality index were retained while the success criterion now became the

admission committee ratings. Regression analysis yielded a multiple R of .78. Dawes points out that it was possible to find a cut point below which no one was admitted by the admissions committee. In comparing the weights used to predict faculty ratings with those used to predict admission committee ratings it was evident that the admission committee did not give enough weight to the quality of the undergraduate college. This quality index was the best single predictor of later faculty ratings.

Seventy-seven graduate psychology students at the University of Rhode Island served as subjects for a study conducted by Merenda and Reilly (1971). The index of college quality used in this study was a three point scale with 1 as poor, 2 being mediocre, and 3 representing better. Just as in the study by Hackman et al. (1970) these ratings were assigned to each undergraduate school by the researchers. Other predictors included GRE scores, scores of the GRE Advanced Psychology Test, undergraduate GPA in psychology courses, and overall undergraduate GPA. The success criterion was a three category discrete variable for which three groups were described as:

> Group A - Students who earned degrees or were in the process of earning degrees with no appreciable delay in process (includes transfers to Ph.D. programs at other institutions).

Group B - Students who earned degrees or who were in process of earning degrees with some delay in process, e.g. course failures, failures on comprehensive examinations, foreign languages, etc.

Group C - Students who failed to earn degrees during this period primarily of scholastic failure, or who had dropped from the program for some other reason. (p. 261)

The results indicated that on the average Group A was higher on all six predictors. The best predictors, in order, were: total undergraduate GPA, GRE Advanced Psychology Test, undergraduate GPA in psychology courses, GRE-verbal, and college quality index. Although the quality index was the lowest of the predictors it was significant. The GRE-quantitative was found to be slightly negatively related to the criterion.

An investigation designed specifically to investigate the usefulness of college quality indicators was conducted by Pitcher and Schrader (1972). This study analyzed validity data gathered at 14 graduate schools of business. Measures of college quality gathered for a sample of 626 colleges were: (1) total mean of the Admissions Test for Graduate Study in Business, (2) ATGSB verbal mean, (3) ATGSB quantitative mean, (4) Law School Admission Test (LSAT) mean, (5) Astin's (1965) "estimated selectivity" score, and (6) average faculty compensation as reported by the

American Association of University Professors. Intercorrelation among the six quality indicators was substantial. This was especially so for the test scores (.86 to .97). While the correlation of Astin's "estimated selectivity" with the test scores was somewhat lower (.74 to .82), it too was substantial. Average faculty compensation correlated .60 with the selectivity index and ranged from .61 to .64 with the test scores.

The records of 3,587 students at 14 graduate business schools were surveyed and data compiled for each of the following: (1) first year graduate GPA; (2) undergraduate GPA; (3) scores on the ATGSB; and (4) the quality of the undergraduate school as measured by the indices previously mentioned. The first year GPA was used as the criterion of success. The results tended to vary among the 14 schools with six studies reporting individual scores on the ATGSB as the best predictor, while four other studies showed undergraduate GPA as the best predictor.

Generally the coefficients for college quality measures tended to be lower than those for undergraduate GPA and ATGSB test scores. Analyses of the median shrunken multiple indicated that the one college quality indicator of ATGSB in combination with the basic predictor of undergraduate GPA, ATGSB - verbal,

and ATGSB - quantitative increased prediction as much as when all six predictors were used (.44 to .48). Astin's selectivity index in combination with the three basic predictors yielded an increase of .02 while average faculty compensation increased the value .01. In combination they resulted in a .02 increase in the median shrunken multiple. While it was felt by the researchers that the college quality indicators generally did not appear effective as single predictors, they may be useful when used in combination with the traditional predictors of undergraduate GPA and test scores.

Studies Employing Graduation vs. Non-Graduation as the Success Criteria

Rupiper (1959) conducted a small study at Oklahoma University in which the success criterion was the attainment of a doctorate degree in education. He administered the GRE to all subjects after a year of study and the GRE Advanced Education Test when subjects had completed one semester of work past the master's degree. Of the 25 subjects 12 graduated and 13 failed. The GRE-Verbal and the Advanced Education Test were found to be significantly related to success. Rupiper concluded by stating that more success criteria needed to be established and he cited Super (1949) who

suggested the establishment of immediate, intermediate, and ultimate criteria.

At Wayne State University in 1958 Benson completed a study using 56 doctoral students in Industrial Education as subjects. Of these 56 students 25 were classified as "successful" and 21 as "unsuccessful." Using analyses of variance, he found significant differences between the two groups in both GRE-Verbal and GRE-Quantitative scores, as well as differences on Miller Analogies scores.

Creager (1965) conducted a follow-up study of 2488 applicants for National Science Foundation Graduate Fellowships in the sciences. The criterion of success used was attainment of the doctorate. Sex and field of graduate study were also investigated. Predictors included GRE-Verbal, GRE-Quantitative, and GRE advanced tests. The GRE advanced test proved to be the best single predictor. Combining all three scores yielded a multiple correlation coefficient higher than that for the advanced test alone.

In an earlier study Creager analyzed data based on 3,491 applicants for 1955 and 1956 fellowships. Predictors in this study were GRE scores, undergraduate GPA in science and mathematics, and reference report ratings. Again the GRE advanced test was found to be the best predictor. GRE-Quantitative was the next

best predictor. Creager concluded that the GRE scores are valid predictors of Ph.D. attainment. Furthermore, for these studies, the GRE advanced test had greater validity than the GRE-Verbal and Quantitative scores.

Lannholm (1972) reviewed a study by Fleury and Capelluzzo conducted in 1969 at the University of Vermont. Subjects were 525 graduate level educational research trainees who had been admitted to 60 Title IV USOE Research Training Programs. A multiple correlation of .38 resulted from the combination of graduate GPA, experience, age, and GRE-Verbal. However, 85% of the variation was unaccounted for.

Roberts (1970) studied a population of 386 master's candidates enrolled in 12 different departments at Wake Forest University. The three predictors of GRE-Verbal, GRE-Quantitative, and GRE-Advanced were correlated with the success criteria of graduate GPA and completion or non-completion of the program. Zero order correlations between predictors and GPA were .43 and .27 for GRE-Verbal and GRE-Quantitative respectively. When the test scores of those completing the master's degree within six years were compared with those who did not, a significant difference was found on the GRE-Verbal and on the advanced tests.

The graduated vs. not-graduated criterion was further investigated by Williams et al. (1970) at the University of North Dakota. They conducted a seven year longitudinal study using 84 doctoral students in the school of education. The students were considered in two groups: (1) those who had received the doctorate; and (2) those who had not received the doctorate or had been inactive for 21 months. The list of 15 variables which served as predictors included, among others, GRE scores, sex, age, undergraduate GPA, and years between master's and doctoral admission. Zero order correlations for the predictor variables showed GRE-Quantitative (.34) and the GRE-advanced (.34) to be significantly related to the criterion. Other significant predictors included sex (.22) and whether the student was a North Dakota graduate (.36). It should be noted that undergraduate GPA correlated only .02 and GRE-Verbal only .08. The multiple correlation revealed that the 15 predictors were significantly related at the .01 level with a correlation of .65 to the graduated vs. not-graduated criterion. However, these variables were not significantly related (.51) to the GPA criterion. None of the individual predictors correlated significantly with the criterion of GPA. The researchers state that "the present study has shown that if a longitudinal study is limited to a single department promising

predictability can be found with the variable of graduated - not-graduated as the criterion" (p. 160). The researchers concluded that the degree attainment criterion is clearly more desirable than graduate GPA.

Rock and Harmon's (1972) study made use of the records of approximately 1000 National Science Fellowship applicants and the NRC office of Scientific Personnel Doctorate Records File. Predictors for the study included GRE scores, GRE advanced test scores, sex, age, marital status, and the quality of the graduate department. Whether or not the Ph.D. was attained in 7-10 years was defined as the success criterion. Results were analyzed according to the three academic areas of mathematics, chemistry, and psychology. For all three areas it was found that the GRE-advanced (.19 to .48) was consistently the highest predictor. However, for chemistry and mathematics the GRE-advanced was reported to be much higher than for psychology.

Correlations for the GRE-Verbal ranged from a low of .12 in psychology to a high of .34 in chemistry. Conclusions were that predictions were more accurate "in the hard science graduate areas of mathematics and chemistry than in psychology" (p. 12).

Studies Using Faculty Ratings as Success Criteria

In an effort to assess quality in graduate school performance without considering grades several researchers have used faculty ratings as an indicator of success.

At Purdue University King and Besco (1960) attempted to predict the success of Purdue Research Foundation Fellows. Subjects were 119 fellowship recipients enrolled between 1956 and 1958. Faculty members rated each student on overall performance in graduate work and additionally indicated "whether they would recommend the ratees for a fellowship had they knows how he would perform as an X-R Fellow" (p. 854). Students were ranked within departments according to faculty ratings, GPA, and GRE scores. Significant relationships were found between verbal ability and the combined criterion of ratings and grades. Recommendations for departmental cut-off scores rather than university ones were made.

Robertson and Nielson (1961) used faculty ratings as the success criterion in a study of 50 psychology students at the University of Florida. Scores on the GRE as well as undergraduate GPA in math, GPA in science, GPA for the last two years of undergraduate college, and overall GPA were used as

predictors. The faculty rating system ranked students as: (1) highest 10%; (2) highest 1/3 excluding top 10%; (3) middle 1/3; (4) lowest 1/3 excluding lowest 10% and; (5) lowest 10%. Scores on the GRE-Verbal and GRE-Quantitative were not significant predictors however, the total score of the two correlated significantly (.29). The best predictors were a combination of GRE-total with undergraduate GPA (.44). The researchers point out that it is easier to predict relative standing than it is to predict success or failure.

Another study at the University of Florida conducted by Robertson and Hall (1964) added 23 graduate students to the sample used in an earlier investigation by Robertson and Nielson (1961). Mean GRE-total scores correlated significantly (.25) with the faculty ratings used as the success criterion. The criterion of comprehensive examination scores was not significantly correlated with any of the predictors.

The Test Office of Sacramento State College (1969) made use of a rating scale to evaluate the success of their master's students. An experimental group of 139 students who completed the master's was compared to a control group of 135 students who withdrew from the program. The rating scale included the following traits:

1. Capacity for analytical thinking
2. Ability to organize and express ideas clearly in writing
3. Ability to express ideas clearly orally
4. Drive and motivation
5. Mastery of conceptual, theoretical material
6. Independence in academic and research activities (p. 4)

Each student was rated on a 1 (poor) to 5 (superior) scale for each of these traits. GPA was also used as a success criterion.

A correlation of .40 between total rating scores for the experimental group and GRE-Verbal scores was found. The GRE-Quantitative correlated .23 while the Advanced Education Test correlated .29. Multiple correlation including the GRE-Verbal and the GRE-Quantitative, plus upper division GPA, used to predict faculty ratings yielded a multiple R of .22 for the experimental group. For the education subsample these variables plus the Advanced Education Test yielded a multiple correlation coefficient of .52 when correlated with faculty ratings. The GRE-Quantitative showed little value as a predictor of either success criteria. Conclusions indicated that for this study the graduate GPA and faculty ratings had about equal value as success criteria.

Reilly (1974) collected data on "specific observable events" that were crucial for student competency in graduate school. Some 99 faculty members in

psychology, chemistry, and English responded to the question of what specific incidents caused them to lower or raise their judgment of the ability of a graduate student. A final list of 52 incidents were retained which were considered valid across disciplines. Further refinement of this work has resulted in a rating scale including eight areas to be noted: (1) communication, (2) conscientiousness, (3) critical facility, (4) independence and initiative, (5) involvement, (6) persistence, (7) research, and (8) teaching. Each area is then rated on a scale of 1 to 5 with specific incidents corresponding to the ratings. The rater also indicated the degree of confidence as very confident, fairly confident, or not very confident. This type of rating appears to be a promising technique for assessing the quality of graduate work while still retaining objectivity.

Studies Using Comprehensive Examination Scores as Success Criteria

At the University of Southern California, Law (1960) used scores on a total comprehensive examination as well as comprehensive scores in four other areas of education as measures of graduate school success. Scores on the GRE-Verbal, GRE-Quantitative, and GRE-Area Tests for 46 doctoral students served as predictors for the study. The most effective predictors of the

total comprehensive criterion (r = 72) were the GRE-Verbal and the social science area test. The successful group scored significantly higher on all predictors and criteria.

At the same university, Michael, Jones, and Gibbons (1960) studied the relationship of GRE scores and a departmental background examination in chemistry. Using the same predictors as Law (1960) they were able to get significant correlations only when using an uncurtailed group of scores. It was concluded that the GRE should not replace the background examination of the chemistry department.

Other Relevant Studies

A large literature review of GRE validity studies (in which some previously cited studies were included) was conducted by Lannholm (1968a, 1972) at Educational Testing Service. In his second review Lannholm (1972) points out that the most often used criterion of success was still the graduate GPA. However, there was a trend toward other criteria such as publishing habits, faculty ratings, and graduation vs. non-graduation. Lannholm summarizes that both undergraduate GPA and GRE scores do seem related to graduate school performance and are most effective when used in combination. Furthermore, he concluded that "the use of some ratings of the quality

of the applicant's undergraduate institution seems sufficiently promising to suggest its use in more research studies" (p. 4). Lannholm also calls for the development of more satisfactory success criteria.

In a review of 43 studies Willingham (1973) summarized the work of Lannholm (1968a, 1972) and Creager (1965), and added several more recent studies. It should be noted that the median N of these studies was 80 with a range of 20 to 1479 subjects. Table 1, developed by Willingham (1973), summarizes median coefficients between various predictors and different success criteria.

It should be noted from the data of Table 1 that the correlation for the composite of GRE-GPA and attainment of Ph.D. is .40. This combination of predictors yields the most consistently high coefficients. Furthermore, Table 1 demonstrates the wide variety of predictors and criteria which have been used in assessing graduate school performance.

Table 2 presents a summary of various validity studies in different graduate fields of study. When the various academic areas are considered separately it becomes apparent that the effectiveness of the predictors varies among departments. From this data presented in Table 2 it is important to note that the

TABLE 1

MEDIAN VALIDITY COEFFICIENTS[a] FOR VARIOUS PREDICTORS AND CRITERIA OF SUCCESS IN GRADUATE SCHOOL[b]

Predictors	Graduate GPA	Overall Faculty Rating	Dept. Exam	Attain Ph.D.	Time
1. GRE-Verbal	.24 (46)	.31 (27)	.42 (5)	.18 (47)	.16 (18)
2. GRE-Quantitative	.23 (43)	.27 (25)	.27 (5)	.26 (47)	.25 (18)
3. GRE-Advanced	.30 (25)	.30 (8)	.48 (2)	.35 (40)	.34 (18)
4. GRE-Composite	.33 (30)	.41 (8)	---	.31 (33)	.35 (18)
5. Undergraduate GPA	.31 (26)	.37 (15)	---	.14 (30)	.23 (9)
6. Recommendations	---	---	---	.18 (15)	.23 (9)
7. GRE-GPA Composite (Weighted)	.45 (24)	---	---	.40 (16)	.40 (19)

[a]The lower number in each pair (in parentheses) represents the number of coefficients upon which each median is based.

[b]From "Predicting Success in Graduate Education" by W. W. Willingham, Papers Presented at the Graduate Record Examinations Board Research Seminar at the 12th Annual Meeting of the Council of Graduate Schools, 1973, 9-32. Copyright 1973 by Educational Testing Service.

TABLE 2

MEDIAN VALIDITY COEFFICIENTS[a] FOR FIVE PREDICTORS OF GRADUATE SUCCESS (VARIOUSLY DEFINED)[b] IN NINE FIELDS[c]

Predictors	Biological Sciences	Chemistry	Educ	Engineering and Applied Science	English	Math	Physics	Psych	Soc. Stud.
GRE-Verbal	.18	.22	.36	.29	.21	.30	.02	.19	.32
	(7)	(14)	(15)	(11)	(6)	(6)	(6)	(23)	(11)
GRE-Quantitative	.27	.28	.28	.31	.06	.27	.21	.23	.32
	(8)	(13)	(14)	(10)	(6)	(6)	(6)	(22)	(10)
GRE-Advanced	.26	.39	.24	.44	.43	.44	.38	.24	.46
	(5)	(9)	(6)	(7)	(3)	(5)	(5)	(17)	(5)
Undergraduate GPA	.13	.27	.30	.18	.22	.19	.31	.16	.37
	(2)	(7)	(5)	(4)	(4)	(4)	(4)	(5)	(6)
GRE-GPA Composite (Weighted)	.35	.42	.42	.47	.56	.41	.45	.32	.40
	(3)	(6)	(7)	(4)	(2)	(3)	(2)	(4)	(5)

[a]The lower number in each pair (in parentheses) represents the number of coefficients upon which each median is based.

[b]In those sets of data where two criteria were included, one was selected for the purpose of this table in the following order of priority: GPA, Attain Ph.D., Dept. Test, and Faculty Rating.

[c]From "Predicting Success in Graduate Education" by W. W. Willingham, Papers Presented at the Graduate Record Examinations Board Research Seminar at the 12th Annual Meeting of the Council of Graduate Schools, 1973, 9-32. Copyright 1973 by Educational Testing Service.

GRE-Verbal shows the highest validity coefficient for predicting graduate school success in education (.36). The coefficient of the GRE-Quantitative in education is the third highest, while the coefficient for the GRE Advanced Education Test (.24) is one of the lowest.

In assessing the results of his review Willingham (1973) concluded that the "GRE and the undergraduate GPA are providing quite useful information in most situations" (p. 15). While he acknowledged the fact that a validity coefficient of .40 is moderate, he felt that such predictors were definitely useful. In agreement with Lannholm (1972) he too calls for the establishment of better success criteria. Willingham considers the criterion of Ph.D. attainment and its corollary time to Ph.D. to be the most defensible criterion since it represents the ultimate success in graduate study. However, he mentions that this criterion is hard to predict and is seldom used at the master's level. He has questioned the appropriateness of this criterion at the master's level especially in programs whose major emphasis is on the Ph.D.

As an alternative to much of the problem of establishing success criteria Willingham (1973) proposed a model which encompasses predictors, program objectives, intermediate criteria, and on-the-job criteria. His model depicts three different program objectives: to

train a practitioner, a teacher, or a scholar/scientist. He added that the success criteria for the practitioner will vary according to fields. This would be particularly so in professional schools.

Summary of the Literature Search

In summary it would appear that the literature demonstrates a wide variety of predictors and success criteria being used in GRE validity studies. Of the studies that used an index of undergraduate college quality only one indicated no usefulness in prediction for that variable (Gertler & Meltzer, 1970). This predictor, however, was not included in the review by Willingham (1973).

Of the seven studies employing the criterion of degree attainment, only one was at the master's level (Roberts, 1970). Another study using this success criterion found sex to be a significant predictor (Williams et al., 1970). While the use of this criterion was questioned at the master's level (Willingham, 1973), it was considered suitable for the present investigation.

There seems to be a general consensus for a need to establish better success criteria. The need for separate departmental validity studies rather than school wide studies has been emphasized (Rock & Harmon,

1972; Williams et al., 1970; Willingham, 1973). Thus far, studies have shown validity coefficients for a combination of GRE-GPA in predicting Ph.D. attainment to be approximately .40 (Willingham, 1973). Education department studies have shown the GRE-Verbal ($r = .36$) to be the best single predictor of variously defined success criteria (Willingham, 1973). When an index of college quality has been added to the combination of GRE-GPA it generally has resulted in at least a small increase in predictor effectiveness (Dawes, 1971; Merenda & Reilly, 1971; Pitcher & Schrader, 1972).

This study will use the success criterion of degree attainment and investigate how well it can be predicted at the master's level. As can be ascertained from the research, this criterion is not often used at the master's level. In agreement with much of the literature, however, this study will be restricted to a single department, a graduate reading program. The research reveals no validity studies which have been conducted exclusively on such a graduate reading program.

CHAPTER III

PROCEDURES

This chapter will describe the subjects, method of data collection, and the treatment of the data.

Subjects

The subjects for this investigation were 152 former master's students enrolled at Rutgers Reading Program. Subjects had been enrolled sometime between the fall of 1964 and the fall of 1974. Of these students 67 had received the M.Ed. and 85 had not completed the program. The latter 85 students were classified in the "not-graduated" group if they had formally withdrawn, been asked to withdraw, or had not been enrolled in any courses for a period of one year. However, the original group of graduates was reduced from 67 to 53, and the non-graduates fell from 85 to 41 because of incomplete records.

Method of Data Collection

The records of all subjects provided the following data: (1) undergraduate GPA; (2) scores on the verbal and quantitative sections of the GRE; (3) undergraduate college attended; and (4) age at time of admission.

Each undergraduate college was assigned a number based on Astin's (1971) selectivity index. This represented the undergraduate college variable used as one of the predictors in this study. If a college did not appear on Astin's (1971) list (eight did not) then Cass and Birnbaum's (1968) Comparison Guide to American Colleges was consulted. Since this book rated colleges by a five category scale, each of these categories was assigned a number. The school's quality index was then computed on a ratio basis to fit it into the seven point scale of Astin (1971).

Treatment of the Data

All of the data were entered on coding sheets and key punched. The data was then computed at the Rutgers University Center for Computer and Information Services. The Program selected was the Statistical Package for the Social Sciences (SPSSH) Version 6.00.

Significant differences between the graduated (N=53) and the not-graduated (N=41) groups were calculated by use of t tests. Correlation coefficients were computed for all 91 subjects. The correlations were generated to determine correlations between:

1. Undergraduate GPA and degree attainment;
2. Verbal scores on the GRE and degree attainment;

3. Quantitative scores on the GRE and degree attainment;
4. Quality of undergraduate school and degree attainment;
5. Age and degree attainment.

Correlations were also computed for graduates only in order to determine correlations between:

1. Undergraduate GPA and years to degree;
2. Verbal scores on the GRE and years to degree;
3. Quantitative scores on the GRE and years to degree;
4. Quality of undergraduate school and years to degree; and
5. Age and years to degree.

Chapter IV will present the results of these computations.

CHAPTER IV

FINDINGS AND DISCUSSION

This chapter will report the results of the computations and discuss their significance. Results will be reported according to hypotheses and will therefore be discussed as they pertain to the hypotheses for the graduated versus not-graduated groups and for the graduated group only.

Findings

Hypotheses for the Graduated Group vs. the Non-Graduated Group

The first hypothesis stated that there would be no significant difference in undergraduate GPA between the two groups. Table 3 shows the results of the t test which was calculated to test this hypothesis. From Table 3 it can be seen that the mean for the graduated group was 3.14 and that of the not-graduated group was 3.01. These mean scores were not found to be significantly different. The null hypothesis was therefore accepted.

The second hypothesis stated that there would be no significant difference in GRE-Verbal scores

TABLE 3

COMPARISON OF FIVE PREDICTOR VARIABLES FOR THE GRADUATED AND NOT-GRADUATED GROUPS

Predictor Variable		N	Mean	S.D.	S.E.	t value
GPA	Graduated	53	3.14	0.49	0.07	0.95
	Not-Graduated	41	3.01	0.45	0.07	
GRE-V	Graduated	53	597.17	86.01	11.81	2.23*
	Not-Graduated	41	557.32	85.91	13.42	
GRE-Q	Graduated	53	501.13	78.93	10.84	0.33
	Not-Graduated	41	495.12	96.77	15.11	
College Qual.	Graduated	53	4.89	1.29	0.18	1.92
	Not-Graduated	41	4.37	1.32	0.21	
Age	Graduated	53	30.49	7.84	1.08	0.95
	Not-Graduated	41	28.95	7.72	1.20	

*Significant at the .05 level.

between the two groups. An examination of Table 3 reveals a mean of 597 for the graduated group while that for the not-graduated group is 557. A t test revealed that GRE-Verbal was the only predictor that did separate the two groups and was significant at the .05 level. The null hypothesis was therefore rejected.

The third hypothesis stated that there would be no significant difference in the GRE-Quantitative scores between the two groups. Results in Table 3 demonstrate that the two groups were very similar in performance on this test. The graduated group had a mean score of 501 while the not-graduated group showed a mean of 495. A t test revealed that these mean scores were not significantly different. The null hypothesis was therefore accepted.

The fourth hypothesis stated that there would be no significant difference in the quality of the undergraduate school attended between the two groups. The means appearing in Table 3 show a mean of 4.9 for the graduated group and one of 4.4 for the not-graduated group. A t test demonstrated that these means were not significantly different. The null hypothesis was therefore accepted.

The fifth hypothesis stated that there would be no significant difference in age between the two groups. Table 3 reveals means of 30.5 and 28.9 for the graduated and not-graduated groups respectively. A t test analysis indicated that these means were not significantly different. The null hypothesis was therefore accepted.

Findings Concerning Hypotheses for the Graduated Group

Table 4 presents the basic findings for this group of hypotheses.

The first hypothesis was concerned with the correlation between the undergraduate GPA and the time taken to attain the M.Ed. degree. Correlation analysis revealed an $r = -.31$ which was significant at the .01 level. Due to this finding the null hypothesis was rejected.

The second hypothesis was concerned with the correlation between GRE-Verbal scores and the time taken to attain the M.Ed. Computations yielded an $r = .21$ which was not significant. The null hypothesis was therefore accepted.

The third hypothesis was concerned with the correlation between the GRE-Quantitative scores and the time taken to attain the M.Ed. The correlation coefficient was computed as .11. Therefore, the null

TABLE 4

CORRELATION COEFFICIENTS FOR FIVE PREDICTOR VARIABLES WITH DEGREE ATTAINMENT AND TIME TO DEGREE

Predictor Variable	Criteria of Success	
	M.Ed. Attainment (N=94) r_{bis}	Time to M.Ed. (N=53)
GPA	.14	-.31*
GRE-V.	.23*	.21
GRE-Q.	.03	.11
Coll. Qual.	.20	-.08
Age	.09	.35

*Significant at the .01 level.

hypothesis was accepted.

The fourth hypothesis was concerned with the correlation between the quality of the undergraduate school and the time taken to attain the M.Ed. As can be seen in Table 4 the r of -.08 was not significant. Consequently the null hypothesis was accepted.

The fifth hypothesis was concerned with the correlation between the age of the subjects and the time taken to attain the M.Ed. The correlation of .35 was significant at the .01 level. The null hypothesis was therefore rejected.

Discussion

Obviously, the results of the study indicate that most of the variables are generally poor predictors of degree attainment. The data in Table 3 demonstrate that, with the exception of GRE-Verbal, these predictors evidently do not discriminate between those students that succeed and those that do not. Table 4 further supports the findings in Table 3, namely that GRE-Verbal was the only consistently significant predictor of degree attainment.

Both tables point out that the undergraduate GPA obviously was not a useful predictor of success since there was no significant difference between the two groups, nor did the GPA variable correlate

significantly with the success criterion. However, several statements seem in order when past research is considered.

The coefficient of .14 shown in Table 4 is equal to the median coefficient for the correlation of GPA with Ph.D. attainment reported by Willingham (1973). Furthermore, the correlation coefficient of .31 in Table 4 for GPA and time to degree was significant at the .01 level. This compares to a coefficient of .23 for the correlation of GPA and time to Ph.D. reported by Willingham (1973). Part of this difference, in addition to a difference in sample, is that time to degree is defined differently. In Willingham's (1973) study "time to degree" was defined as the time lapse between attainment of the B.A. and Ph.D., while this study defined "time to degree" as the time between enrollment in the program and attainment of the M.Ed. Despite the difference in definition of "time to degree," the fact remains that the criteria of degree attainment and time to degree were as predictable in this study as they were in those reported by Willingham (1973). This study would indicate that they may be as appropriate at the master's level as they are at the Ph.D.

As mentioned previously the undergraduate GPA did correlate significantly ($r = .31$) with the time to degree criterion. As Table 3 indicates, however, the

two groups were not significantly different in undergraduate GPA. Gertler and Meltzer (1970) have suggested that undergraduate GPA might act as an indicator of motivation. Results of this study indicate that this might be a possibility for those who remain in the program.

The fact that the GRE-Verbal was the only variable that was significantly different for the two groups warrants further discussion. The correlation coefficient ($r = .23$) found in Table 4 reveals that the GRE-Verbal was the best predictor of degree attainment. While this was statistically significant at the .01 level, from an educational point of view it only accounts for 5% of the variance. This coefficient ($r = .23$) falls well below that of .36 found in the education departments reviewed by Willingham (1973). However, it should be noted that the GRE-Verbal score did rank as the best predictor in this study. This would agree with Willingham's (1973) review of validity studies as well as studies by Benson (1958) and Rupiper (1959). Roberts (1970) has also reported similar results and found a significant difference in GRE-Verbal scores between a group that completed a master's degree and a group that did not. However, the number involved in this last study were quite small.

A further comparison of results with Willingham's figures as given in Table 1 provide some interesting information. Willingham's (1973) figures show a correlation of .18 and .16 for the GRE-Verbal with the criteria of "Ph.D. attainment" and "time to degree" respectively. The results of this study in Table 4 reveal coefficients of .23 and .21 for these two criteria respectively. The coefficients found in this study are slightly higher, yet of the same magnitude, as those evident in Willingham's (1973) review. The differences may be due to differences in types of students as well as differences in cut-off points used in student selection. Willingham (1973) seems justified in stating that these success criteria of "degree attainment" and "time to degree" are difficult to predict. However, the present results do tend to indicate that they may be as relevant at the master's level as they are at the Ph.D. level.

The quality of the undergraduate school attended for the graduated group and the not-graduated group was not significantly different. Indeed, the quality index did not correlate significantly with degree attainment. Several studies (Dawes, 1971; Hackman et al., 1970; Hansen, 1970; Merenda & Reilly, 1971; Pitcher & Schrader,

1972) have demonstrated generally that a college quality index can provide useful information in predicting success. Since this study showed no difference between the two groups for the predictor of college quality and indicated such a weak correlation with degree attainment, it seems impossible to make any definitive statements as to agreement or disagreement with these studies.

The coefficients for the predictor variable of age as presented in Table 4 appear similar to those for GPA. As discussed in the results section the two groups were not significantly different in age. Nor did the age variable correlate significantly with the criterion of M. Ed. attainment. However, the correlation between age and time to degree yielded a coefficient of .35 which was significant at the .01 level. Among the group that graduated it appears that the younger ones complete their programs more quickly. In light of the fact that the younger student might have less outside responsibilities (job, family, civic duties, etc.) this finding seems understandable.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The results of the data indicated that few definitive statements could be made from this investigation. All coefficients computed were very modest and the groups were significantly different only in regard to their GRE-Verbal scores. The GRE-Verbal score yielded the highest correlation ($r = .23$) with the success criterion of degree attainment. This coefficient is consistent with those obtained in other research done in Chemistry, English, and Psychology. Furthermore, the fact that the coefficient for the GRE-Verbal score was the highest of all predictors is another indication that this study agrees with most other studies completed in education departments.

Undergraduate GPA and age yielded the highest coefficients ($r = .31$ and $r = .35$) when correlated with the criterion of "time to degree." These results may indicate that, while prediction was obviously low, the success criterion used in this study of M.Ed. subjects may be as relevant at the master's level as the

B.A.-Ph.D. time lapse criterion was at the doctorate level.

Need for Further Research

The results of this study indicate the need for further research in the following areas:

1. A larger sample of subjects should be accumulated in several years which could be studied using degree attainment and a rating scale as the two measures of success. This rating scale could draw from Reilly's (1974) list of "critical incidents" in graduate student performance. The same predictor variables used in this study could then be correlated with these two success criteria.

2. An in-depth study of the students that drop out of the reading program should be conducted. This, however, necessitates immediate follow-up and would need to be an on-going process. When numbers permit studies could be conducted using those that left for academic reasons as well as those that left for other personal reasons.

3. When numbers permit, a study could be conducted which examines whether these predictor variables predict any differently for the students in the master's program as compared to those in the doctorate program at the Reading Center.

Implications for Admission Policies

Few definitive statements can be made from the data obtained in this study. As the research review and need for further research sections suggest, however, there is a need for establishing better success criteria. Willingham (1973) has indicated the very basic need for establishing departmental objectives and for evaluating students in terms of these objectives. He has advocated the idea of intermediate and on-the-job success criteria. Creager and Harmon (1966) have completed extensive work in on-the-job validation of selection variables.

The Rutgers Reading Program is training reading specialists to work as remedial reading teachers, reading supervisors, or reading consultants (Kling, 1975). How well do their graduates perform in these jobs? This on-the-job performance appears as the most defensible criterion of success. On-the-job evaluations would be difficult in terms of time and money. However, such an evaluation in combination with a rating scale of graduate school performance might offer unique insights as to the effectiveness of student selection and the accomplishment of departmental objectives.

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APPENDIX A

RAW DATA FOR GRADUATED AND NOT-GRADUATED GROUPS

Graduated	GPA	GRE-V	GRE-Q	Coll. Qual. Index	Age	Years to M.Ed.
01	3.3	580	400	2	25	2
02	3.7	580	560	5	37	5
03	2.3	540	570	4	44	5
04	3.3	620	540	5	28	4
05	2.2	560	410	4	27	4
06	3.4	760	590	5	34	3
07	2.8	570	580	5	32	4
08	3.5	640	500	4	21	3
09	3.4	580	500	7	35	3
10	2.9	520	480	4	26	1
11	3.5	680	650	4	26	5
12	3.4	550	480	4	49	4
13	3.1	480	410	5	32	5
14	3.5	490	410	4	29	3
15	2.9	490	560	5	23	1
16	3.5	540	460	5	28	4
17	2.2	550	540	4	30	3
18	3.5	520	410	4	44	4
19	3.2	510	490	4	24	5
20	3.7	590	470	4	41	3
21	4.0	730	670	5	21	2
22	3.4	700	590	5	22	4
23	2.6	650	610	7	41	5
24	3.8	550	560	5	22	3
25	3.3	690	580	6	49	5
26	2.7	690	460	7	37	4
27	2.7	560	520	5	23	3
28	3.0	720	660	7	21	3
29	2.5	560	470	5	26	3
30	3.5	480	550	4	22	3
31	2.5	570	490	5	27	3
32	3.6	530	560	5	27	3
33	3.2	590	350	6	29	3
34	2.3	610	530	4	26	3
35	2.8	660	560	4	35	3
36	3.7	500	390	5	35	4
37	2.6	490	410	4	36	5
38	2.5	540	440	6	39	5

Graduated	GPA	GRE-V	GRE-Q	Coll. Qual. Index	Age	Years to M.Ed.
39	3.4	680	550	4	43	3
40	2.2	730	540	7	36	5
41	3.4	630	480	4	24	2
42	3.1	480	470	4	23	4
43	2.8	500	550	4	21	4
44	3.0	570	410	1	25	5
45	2.6	520	530	3	21	4
46	3.2	680	550	5	27	3
47	3.9	740	520	6	23	3
48	3.7	680	480	7	33	3
49	3.2	510	330	5	40	3
50	3.6	770	420	7	26	1
51	3.0	640	490	7	38	4
52	3.2	570	490	5	24	2
53	4.0	780	340	7	39	1

Not Graduated	GPA	GRE-V	GRE-Q	Coll. Qual. Index	Age	Years to M.Ed.
54	3.4	510	560	4	22	
55	3.5	570	360	4	46	
56	3.7	640	490	3	31	
57	3.1	570	610	7	30	
58	3.5	590	360	3	50	
59	3.0	720	540	6	31	
60	2.7	570	450	4	25	
61	3.3	680	750	7	24	
62	3.5	630	580	5	25	
63	3.0	430	440	3	22	
64	3.2	620	490	3	24	
65	2.6	430	570	3	25	
66	2.8	420	420	2	24	
67	3.2	590	640	5	22	
68	2.5	560	410	5	50	
69	2.7	480	510	5	24	
70	3.0	500	480	4	23	
71	3.5	510	500	4	24	
72	3.5	560	510	5	36	
73	3.5	520	450	3	27	
74	3.3	590	550	4	27	

Not Graduated	GPA	GRE-V	GRE-Q	Coll. Qual. Index	Age	Years to M.Ed.
75	2.6	540	450	4	24	
76	3.5	710	580	6	25	
77	2.6	640	650	5	28	
78	3.0	570	460	4	22	
79	2.5	590	460	3	33	
80	3.3	610	630	4	39	
81	2.8	440	510	6	23	
82	3.0	560	510	6	41	
83	2.5	580	410	5	29	
84	2.3	430	500	4	25	
85	3.1	650	590	7	26	
86	3.4	740	540	5	25	
87	3.0	600	480	5	40	
88	2.6	470	290	3	27	
89	3.2	590	560	4	24	
90	1.9	450	320	1	34	
91	2.0	580	360	6	40	
92	3.7	460	660	4	25	
93	3.0	620	430	6	25	
94	2.8	420	420	2	24	